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**Further taxonomic notes on *Amraica recursaria* (Walker)
(Lepidoptera: Geometridae) and its allies, with descriptions of
two new species from Southeast Asia**

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Abstract The variation in the male genitalia of *Amraica recursaria* (Walker) is discussed. *A. asahinai* (Inoue) is sunk as a junior synonym of *recursaria*. *A. jaculatrix* and *A. inouei* are described as new to science, from Sulawesi and Thailand respectively.

Key words *Amraica*, variation of genitalia, new species, Geometridae, Southeast Asia.

The genus *Amraica* Moore, 1888, had been treated as a subgenus of *Buzura* Walker, [1863] 1862, since Prout (1915), before it was raised to the rank of a genus by Inoue (1982). *Amraica* is characterized clearly by the unipectinate male antenna, while *Buzura* has the bipectinate antenna. In my previous paper (Sato, 1981), *recursaria* (Walker), the type species of *Amraica*, was redescribed, and its Japanese subspecies, *superans* (Butler) from the mainland and *asahinai* (Inoue) from the Ryukyus, were upgraded to a distinct species, respectively. My further examination of many specimens taken from Southeast Asia revealed that *asahinai* should be regarded as a junior synonym of *recursaria*. Further two new species will be added to the members of *Amraica* in this paper.

The following abbreviations are used to indicate the location of material examined. NSMT: National Science Museum, Tokyo. BMNH: British Museum (Natural History), London. UOP: Entomological Laboratory, University of Osaka Prefecture, Sakai. ZMC: Zoological Museum, Copenhagen, Denmark. HI: H. Inoue collection, Iruma. RS: R. Sato collection, Niigata.

Amraica recursaria (Walker) (Fig. 1)

Boarmia recursaria Walker, 1860: 374.

Amraica recursaria: Swinhoe, 1894: 213.

Biston (Amraica) recursaria: Hampson, 1895: 246.

Buzura (Amraica) recursaria: Prout, 1915: 360; Sato, 1981: 85.

Boarmia ferrolavata Walker, [1863] 1862: 1536.

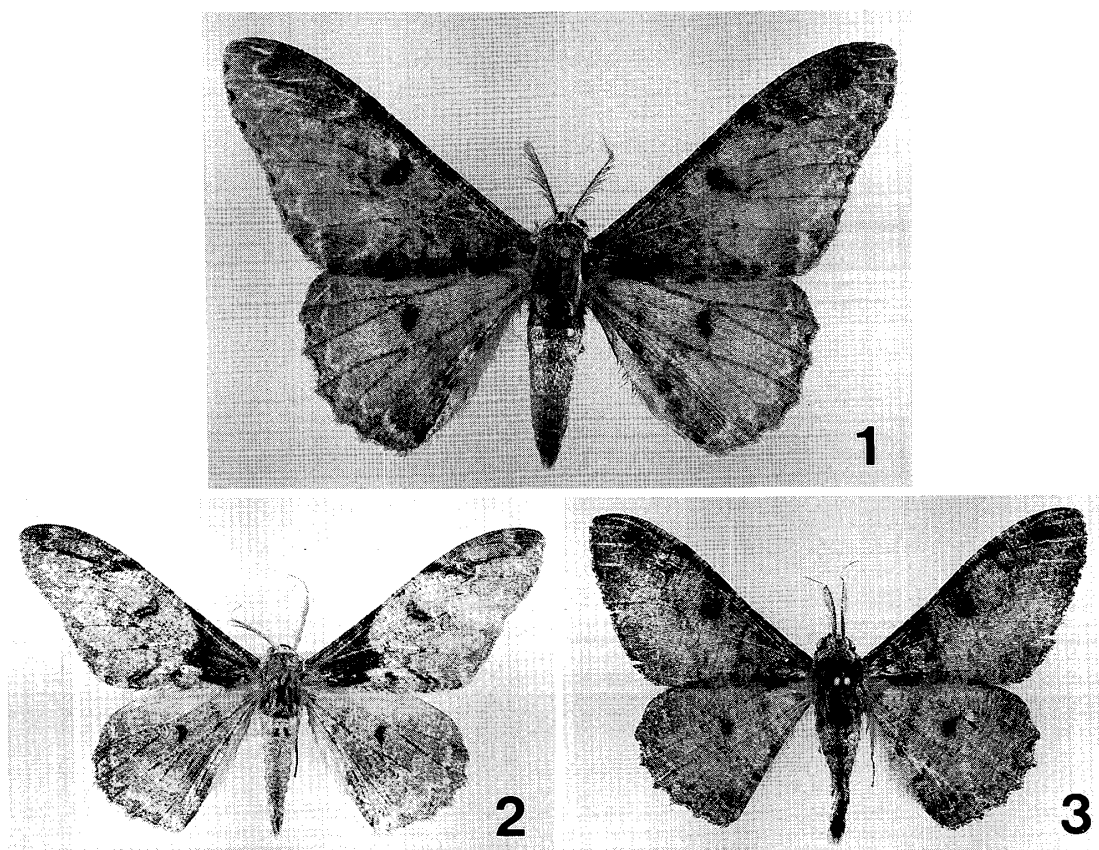
Boarmia solivagaria Walker, 1866: 1586.

Amraica fortissima Moore, 1888: 245.

Buzura recursaria asahinai Inoue, 1964: 337. **Syn. nov.**

Asahinai was described as the Ryukyuan subspecies of *recursaria*, and has been treated as a good species since my previous paper (Sato, 1981). Later it was also recorded from Taiwan (Sato, 1986). My further study based on many Southeast Asian specimens revealed that *recursaria* is more variable in the male genitalia, especially in the shape of harpe, rather than in the wing shape, colour and maculation. Much longer harpe is pointed

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Figs. 1-3. *Amraica* spp. 1. *A. recursaria* (Walker). Sumatra. 2. *A. jaculatrix* sp. nov. Paratype. Sulawesi. 3. *A. inouei* sp. nov. Holotype. Thailand.

out as one of the most useful characteristics to distinguish *asahinai* from *recursaria*. However the degree of development of harpe is not useful to identify *Amraica* species.

There are three typical forms in the shape of harpe with a few intermediate states.

Form A (Figs. 4 & 5). Harpe asymmetrical, left harpe longer than right one, gradually broadened apicad, with many short spines at apical portion.

Form B (Figs. 8 & 9). Harpe asymmetrical, left harpe much longer than right one, abruptly broadened into a large globe with many short spines at apical portion.

Form C (Figs. 6 & 7). Harpe symmetrical, slender, extending near the apex of ventral margin of valva, apical portion small with shorter spines.

The holotype of *asahinai* is identical with form C (Inoue, 1964). In some districts only one form was collected; such as India (form A), Nepal (C), Sumatra (B), Sulawesi (C), Taiwan (C) and Japan (C). But in Malaysia and Thailand two or three forms were taken sympatrically. Borneo and Palawan populations show the intermediate state between the two forms B and C, or A and B. It is very difficult to draw lines between populations taken from different habitats. *Asahinai* is surely one form of *recursaria*, and should be sunk as a junior synonym of *recursaria*.

Female genitalia are also variable in the shape of sterigma, but it is impossible to separate them into some forms because of a shortage of material.

Male material examined.

India—Form A. 3 ♂. Khasia Hills, 1 ♂, v. 1973, 2 ♂, Khasia Hills, HI. Male genitalia were shown in my previous paper (Sato, 1981: 89, fig. 11).

Nepal—Form C. 16 ♂. Godavari, 1,500 m, 1 ♂, 2-6. vi. 1987 (T. Miyashita), RS, 4 ♂, 14-29. iv. 1990, 3 ♂, 4-18. v. 1990, 8 ♂, 5-15. v. 1991 (*ex* T. Haruta), NSMT.

Thailand—Form A. 5 ♂. Nakhon Nayok, Kao Yai, 800 m, 1 ♂, 25. viii. 1981 (H. Kuroko, S. Moriuti, Y. Arita, Y. Yoshiyasu), 2 ♂, 11-19. xi. 1985 (S. Moriuti, T. Saito, Y. Arita), UOP. Chanthaburi, Kao Soi Dao, 400 m, 1 ♂, 24-25. viii. 1987 (S. Moriuti, T. Saito, Y. Arita, Y. Yoshiyasu), UOP. Loei Province, Phu Luang Wildlife Sanctuary, 700-900 m, 1 ♂, 8-14. x. 1984 (Karsholt, Lomholdt, Nielsen), ZMC. Form B. 5 ♂. Nakhon Nayok, Kao Yai, 800 m, 2 ♂, 14-15. vi. 1983 (H. Kuroko, S. Moriuti, Y. Arita, Y. Yoshiyasu), UOP. Chanthaburi, Kao Soi Dao, 400 m, 3 ♂, 6-7. vi. 1983 (H. Kuroko, S. Moriuti, Y. Arita, Y. Yoshiyasu), UOP. Form C. 3 ♂. Nakhon Nayok, Kao Yai, 800 m, 1 ♂, 18. vi. 1983 (H. Kuroko, S. Moriuti, Y. Arita, Y. Yoshiyasu), 1 ♂, 7. viii. 1987 (S. Moriuti, T. Saito, Y. Arita, Y. Yoshiyasu), UOP. Nakhon Si Thammarat, Tha Sala Kra Raw, Kan Leong, 650 m, Khao Luang Natn. Pk., 1 ♂, 7-8. viii. 1987 (M. Owada), NSMT.

Malaysia—Form A. 12 ♂. Perak, Taiping, 6 ♂, vii. 1987 (native collector), 1 ♂, 28. v. 1987, 1 ♂, 30. v. 1987, 1 ♂, 5. vi. 1987 (native collector), RS. Cameron Highlands, 1 ♂, 1984 (native collector), HI. Bukit Lamt, 2 ♂, 6-7. i. 1990 (T. Yasunaga), RS. Form B. 4 ♂. Perak, Taiping, 1 ♂, vii. 1987 (native collector), 1 ♂, 12. vi. 1987 (native collector), RS. Bukit Lamt, 1 ♂, 3. i. 1990 (T. Yasunaga), RS. Fraser's Hill, 1 ♂, 22-24. iv. 1990 (N. Bito), RS.

Borneo—Intermediate between forms B and C. Closer to form C, but left harpe slightly shorter than right one. 2 ♂. Sabah, Sepulut, 500 m, 1 ♂, 31. viii. 1987 (Y. Watanabe), RS. Karimantan Barat, Mt. Bawan, 300 m, 1 ♂, x. 1989 (N. Nishikawa), RS.

Palawan—Intermediate between forms A and B (Fig. 10). Closer to form A, but apical portion of harpe more swollen. 2 ♂. Victoria Peaks, Trident Mines, 500 m, Nr. Narra, 1 ♂, 3-5. ix. 1985 (M. Owada), RS. S. Vicente, 20 km NEE Roxas, 1 ♂, 12-17. i. 1988 (Cerny, Schintlmeister), RS.

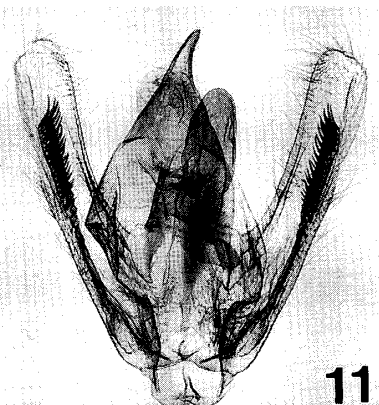
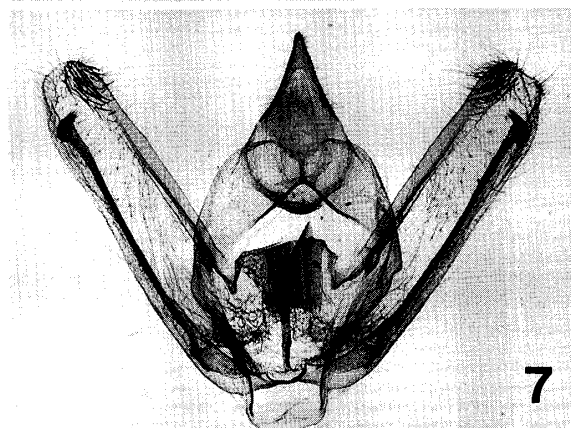
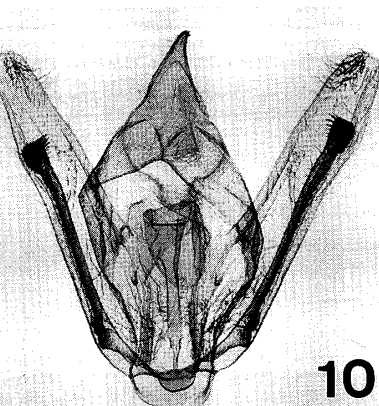
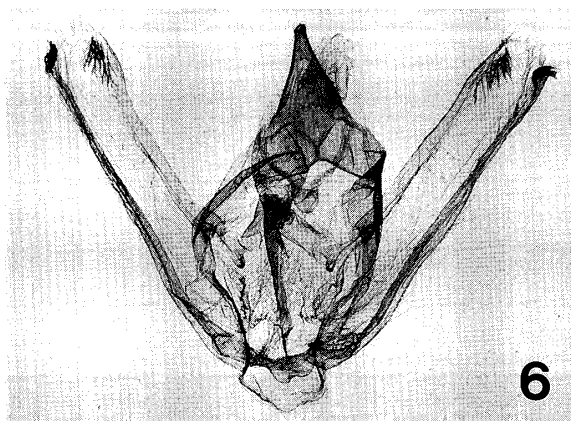
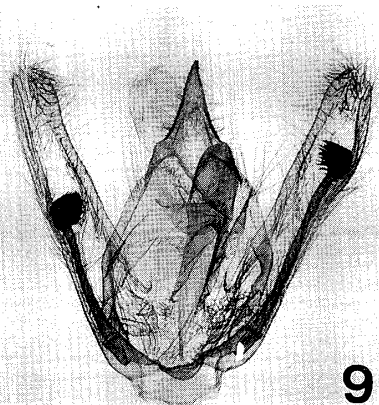
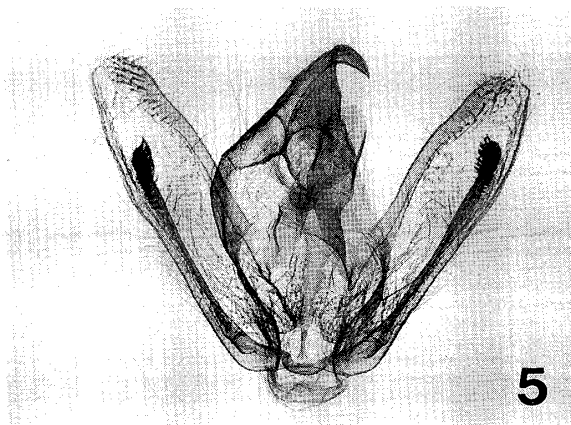
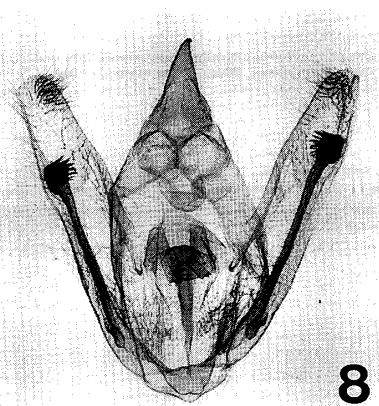
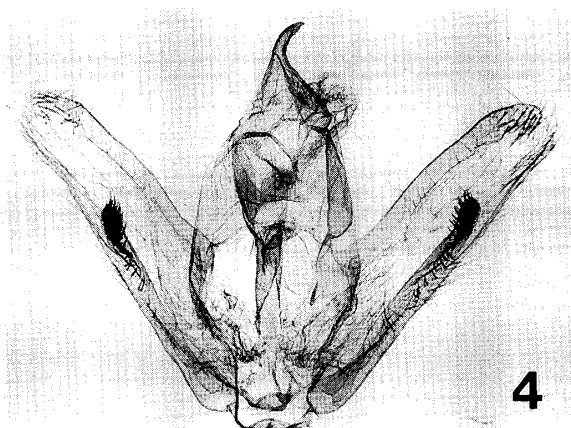
Mindanao—Similar to form A, but symmetrical with longer apical spinose area (Fig. 11). 2 ♂. Davao, Upper Baracatan, Apo Range, Mt. Talomo, 1,100 m, 2 ♂, 3-6. vii. 1985 (M. Owada).

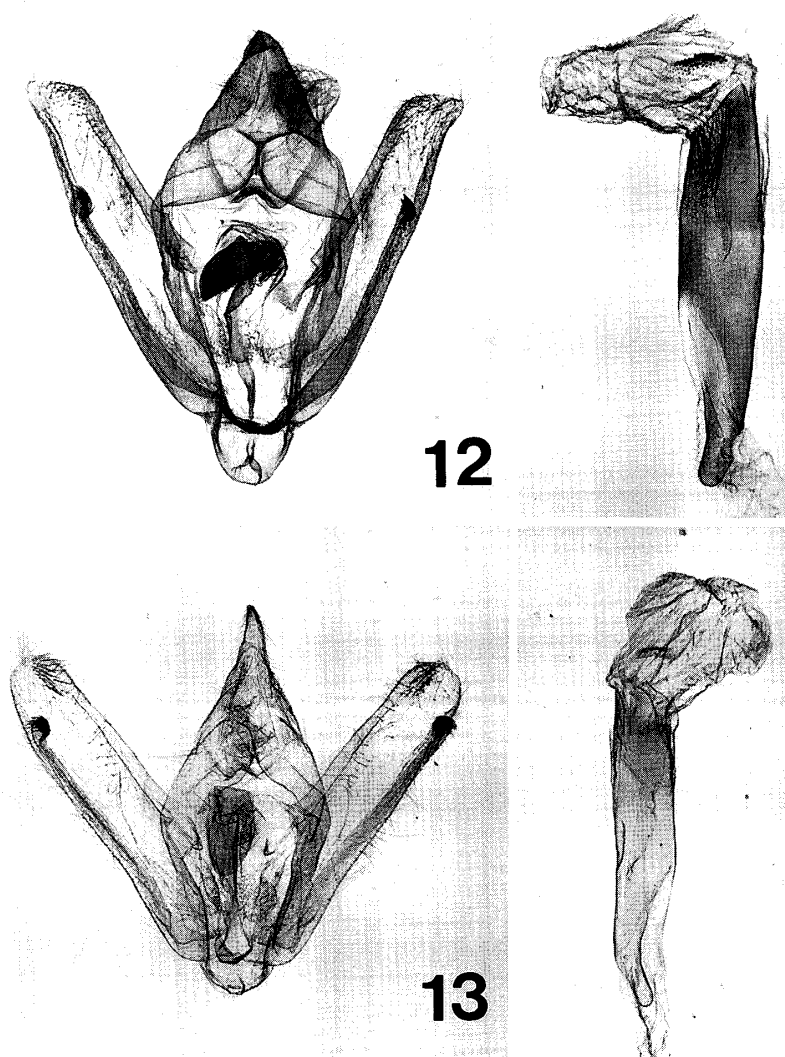
Sumatra—Form B. 14 ♂. Gunung Malayu, 80 m, 3 ♂, 4-5. v. 1983, 1 ♂, 2-3. vii. 1983 (E. W. Diehl), RS. Dairi Mts., 1 ♂, 28. viii. 1979 (E.W. Diehl, A. Schintlmeister), RS. Holzweg II, 1,050 m, 18 km to Prapat, 1 ♂, 20. v-22. vii. 1985, 1 ♂, 19. xi. 1986, 1 ♂, 29. xi. 1986, 2 ♂, 28. vii. 1990, 1 ♂, 17. x. 1990 (E.W. Diehl), 1 ♂, 22-24. vii. 1985 (R. Sato), RS. Sindar Raya, Vorgebirgsurwald, 350 m, 1 ♂, 11-14. viii. 1979 (E.W. Diehl, A. Schintlmeister), RS. P. Siantar, 1 ♂, 8. ii. 1991 (E.W. Diehl), RS.

Sulawesi—Form C. 5 ♂. Palolo, 700 m, 4 ♂, ii. 1986, 1 ♂, vii. 1986 (S. Nagai), RS.

Taiwan—Form C. 4 ♂. Hsinchu Hsien, Mt. Shihtou-shan, 1 ♂, 9-10. viii. 1983 (R. Sato), RS. Chiayi Hsien, Shihtzulu, 1,520 m, 1 ♂, 5-6. v. 1984 (H. Yoshimoto); Fenchihu, 1 ♂, 12-13. viii. 1983 (R. Sato), RS. Kaohsiung Hsien, Paolai, 450 m, 1 ♂, 26-28. vii. 1987 (R. Sato), RS.

Figs. 4-11. Variation in the male genitalia of *Amraica recursaria* (Walker). 4-5. Form A. 4: Malaysia. RS-3413. 5: Thailand. RS-3481. 6-7. Form C. 6: Thailand. RS-3264. 7: Sulawesi. RS-2343. 8-9. Form B. 8: Sumatra. RS-2345. 9: Thailand. RS-3382. 10. Intermediate state between A and B. Palawan. RS-2342. 11. Similar to form A. Mindanao. RS-2341.





Figs. 12-13. Male genitalia of *Amraica* spp. 12. *A. jaculatrix* sp. nov. Paratype. RS-2311.
13. *A. inouei* sp. nov. Paratype. RS-3179.

Japan—Form C. 93 ♂. Collected in Is. Shimokoshikijima, Yakushima, Amamioshima, Okinawa, Kumejima, Miyakojima, Ishigakijima, Iriomotejima. The genitalia of one male from Is. Yakushima were illustrated in my previous paper (Sato, 1981 : 89, Fig. 15).

Female material examined.

Sumatra—2 ♀. Gunung Malayu, 1 ♀, 13-14. viii. 1983 (E.W. Diehl), RS. Holzweg II, 1,050 m, near Prapat, 1 ♀, 6. ix. 1986 (E.W. Diehl), RS.

Taiwan—1 ♀. Kaohsiung Hsien, Sanping, 1 ♀, 28. iv. 1985 (S. Saito), RS.

Japan—4 ♀. Is. Ishigaki-jima, Mt. Omoto-dake, 1 ♀, 29. iii. 1987 (S. Itoh), RS. Is. Iriomote-jima, Komi-Otomi, 1 ♀, 22. iii. 1974 (Y. Fujimaki), RS. Okinawa, Kunigami-son, Ginama, 1 ♀, 12-13. viii. 1980 (R. Sato); Chinen-son, Seifuautaki, 1 ♀, 8-9. viii. 1980 (R. Sato), RS.

Distribution. India, Nepal, Japan, Taiwan, Palawan, Mindanao, Vietnam, Maynmar, Thailand, Malaysia, Borneo, Sumatra, Java, Sulawesi, New Guinea.

Biology. Host plants are unknown, but larvae hatched from eggs laid by a captured

female were reared on *Euonymus japonicus* Thunb. (Celastraceae). The mother moth was taken at Mt. Omoto-dake, Is. Iriomote-jima, on 29th of March in 1987.

***Amraica jaculatrix* sp. nov.** (Fig. 2)

Length of forewing. ♂. 28-30 mm. Similar to *recursaria*, but different from it as follows. Wings more elongate. Ground colour grey, not tinged with brown. Discal spot smaller, not roundish, but hooked. Forewing: antemedial line black, more clearly defined, acutely curved outward at the middle; basal part dark grey; postmedial line enlarged near termen, forming a band-like marking. Underside of wings paler, with smaller discal spots. Female unknown.

Male genitalia (Fig. 12). Similar to those of *recursaria*. Valva slenderer, pointed apically. Harpe symmetrical, as in form C of *recursaria*, but much shorter.

Holotype. ♂. Sulawesi, labelled "Lindoe Paloe, 3700', W. Celebes, April 1937, J.P.A. Kalis/Buzura jaculatrix Prout ♂, type/Rothschild Bequest, B. M. 1939-1/Geometridae genitalia slide No. 13729", BMNH. Paratypes. 6 ♂. Sulawesi, 2 ♂, "G. Tompoe, Paloe, W. Celebes, 2700', Feb. 1937, J.P.A. Kalis/Rothschild Bequest, B. M. 1939-1"; 1 ♂, "Koelawi Paloe, 3100', W. Celebes, March 1937, J.P.A. Kalis/Rothschild Bequest, B. M. 1939-1", BMNH. 1 ♂, S. Sulawesi, Nr. north border, Sanpuraga, 1,500 m, ix-x. 1985 (S. Nagai), 2 ♂, 28. v-3. vi. 1986 (S. Nagai), RS.

Distribution. Sulawesi.

Remarks. Four male specimens of this species are preserved in the BMNH under the name of "*Buzura jaculatrix* Prout", but this taxa was not described by Prout.

***Amraica inouei* sp. nov.** (Fig. 3)

Length of forewing. ♂ 22-25 mm. Similar to *recursaria*, but separable from it as follows. Generally smaller. Forewing ampler, termen not concave at middle. Ground colour darker, densely suffused with reddish brown. Lines more clearly defined. Hindwing with post-medial line, while almost invisible in *recursaria*. Female unknown.

Male genitalia (Fig. 13). Similar to those of *recursaria*. In the shape of harpe very similar to form C of *recursaria* and it is difficult to separate the two by the male genitalia.

Holotype. ♂. N. Thailand, Doi Suthep, 1,100 m, 22-23. viii. 1990 (H. Inoue), HI. Paratypes. 6 ♂. Chiang Mai, Fang, 450 m, 2 ♂, 13-16. ix. 1987 (S. Moriuti, T. Saito, Y. Arita, Y. Yoshiyasu), UOP. Chanthaburi, Khao Soi Dao, 400 m, 1 ♂, 24-25. viii. 1987 (S. Moriuti, T. Saito, Y. Arita, Y. Yoshiyasu), UOP. Loei, Phu Rua, 800 m, 1 ♂, 15-19. viii. 1987 (S. Moriuti, T. Saito, Y. Arita, Y. Yoshiyasu), UOP. Phitsanulok, Nakhon Thai, Phu-Hin Rongkla, 1,200 m, 1 ♂, 26-27. viii. 1987 (M. Owada), NSMT. Nam Phrom Dam, Farm of Khon Kaen Univ., 1 ♂, 8. viii. 1980 (S. Azuma), HI.

Distribution. Thailand.

Remarks. Although the male genitalia of this species are identical with those of *recursaria* (form C), there are some remarkable differences in wing shape, colour and maculation.

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摘 要

Amraica recursaria (Walker) とその近似種に関する再検討と 2 新種の記載 (佐藤力夫)

Amraica 属は、雄の触角が単櫛歯状である点で特徴づけられる。筆者は、先に日本の種について検討し、*recursaria* と同種とされていたウスイロオオエダシャクを独立種と認め、亜種 *superans* (Butler) を種に昇格させた。同時に、*superans* の南西諸島亜種として扱われてきた *asahinai* (Inoue) も、下甕島、屋久島の同一地点で *superans* と同時に採集されたことから、別種であることが判明、アサヒナオオエダシャクと新称された (Sato, 1981)。その後、インド、ネパールからタイ、ボルネオ、スマトラなど各地の本属標本を研究した結果、*recursaria* の雌雄交尾器の形態にはかなりの変異があり、特に雄交尾器の harpe の形状には著しい変異の認められることが分かった。この変異傾向を考慮すると、*asahinai* は、*recursaria* と同種と考えるべきとの結論に達した。したがって、今後アサヒナオオエダシャクの学名は、*A. recursaria* (Walker) を使うことになる。なお、この研究の過程で、外観で明らかに区別される次の 2 種を見だし、新種として記載した。

A. jaculatrix Sato (Sulawesi).

A. inouei Sato (Thailand).

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